

AMENDMENTS TO THE SPECIFICATION

Please replace the paragraph at page 3, beginning on line 20 and ending on page 4, line 6, with the following rewritten paragraph:

--~~As prior arts known as~~Among the prior art methods that ~~can~~for the manufacture high silicon steel sheets, Japanese Patent Laid Open Publication No. 56-3625, ~~etc., discloses a direct casting of high silicon steel using a single roll or twin rolls, Japanese~~ Paid Laid Open Publication No. 62-103321, ~~etc., discloses a warm rolling in which rolling is performed in a heating-heated state of at a proper temperature, and Japanese Patent Laid~~ Open Publication No. 5-171281, ~~etc., discloses a clad rolling in which rolling is performed in a state that wherein the high silicon steel is located at an inner portion and a low silicon steel is located at an outer portion. However, the aforementioned prior arts have been~~arts has not yet been commercialized.--

Please replace the paragraph at page 4, beginning on line 7, with the following rewritten paragraph:

--For mass production of high silicon steel products such as 3% Si non-oriented steel products, ~~there is a well known a process including~~includes the steps of depositing silicon on a surface of a material by a chemical vapor deposition using SiCl₄ and then homogenizing the silicon, as disclosed in prior arts of Japanese Patent Laid Open Publication No. 62-227078, US Patent No. 3,423,253 ~~and the like, among others~~. However, the above process causes the ~~produced~~manufactured products to be sold inevitably at a price five times higher than the conventional 3% Si steel products due to the difficulty in the CVD process. In spite of this fact that the produced~~these~~ products ~~have~~possess superior magnetic properties, it is difficult to popularize and commercialize such products due to the excessive high cost thereof.--

Please replace the paragraph at page 4, beginning on line 20, with the following rewritten paragraph:

--Also, EP1052043A2, JP2000192204, JP2000144248, JP200045025, ~~etc.~~among others, disclose processes for manufacturing high silicon steel sheets using powder

metallurgy. However, these prior arts have a limitation in that the high silicon content ~~fails to prevent the manufacture of~~ steel sheet with ~~a~~ the desired thickness.--

Please replace the paragraph at page 5, beginning on line 1 with the following rewritten paragraph:

--Further, ~~USP-US Patent 3,634,148, USP-US Patent 4,073,668 and the like proposes-propose~~ a long-term annealing process in which Fe-Si alloy powder only or ~~mixture~~ a mixed powder of Fe-Si powder and binder is prepared ~~the mixture~~. The mixed powder is rolled at a reduction ratio less than 5% and then annealed for a long term. However, the process to coat powder on matrix material and then apply a rolling process makes it difficult to perform cold rolling and is also not desirable in a mass production system. Also, a low temperature long term annealing is not proper in mass production upon considering the productivity.--

Please replace the subheading on page 6, line 3 with the following rewritten centered subheading.

~~-- Disclosure of the Invention~~ **SUMMARY OF THE INVENTION--**

Please replace the subheading on page 8, line 15 with the following rewritten centered subheading.

~~--BEST MODE FOR CARRYING OUT~~ **DETAILED DESCRIPTION OF THE INVENTION--**

Please replace the paragraph at page 9, beginning on line 4 with the following rewritten paragraph:

--When comparing the interdiffusion reaction of Fe atoms and Si atoms, since the diffusion rate of Si is approximately faster two times greater than that of Fe atoms in a temperature range of 1000 - 1200 °C, ~~there occurs a phenomenon called~~ occurs, known as the Kirkendall effect corresponding to a non-homogenous diffusion state. This non-homogeneous diffusion state causes non-homogenous state defects at a reaction interface or creates various compounds such as FeSi₂, FeSi, Fe₅Si₃ or Fe₃Si, which act as a factor in

deteriorating magnetic properties. Accordingly, it is in fact impossible to produce high silicon grain-oriented electrical steel sheets having a homogenous composition without surface defects by coating the silicon containing powder on the electrical steel sheet and diffusing Si atoms at a high temperature.--

Please replace the paragraph at page 9, beginning on line 19 and ending on page 10, line 1, with the following rewritten paragraph:

--To solve the above problem, the inventor repeated researches on diffusion principle and so forth using Si powder and Fe powder, and finally found that the defects in the diffusion reaction portion are effectively removed not by using a coating composition including Si powder only as siliconizing agent but by using a coating composition of a Fe-Si-based composite compound. ~~Accordingly, the inventor suggests the present invention.--~~

Please replace the paragraph at page 10, beginning on line 2 with the following rewritten paragraph:

~~--In other words, the~~ The present invention provides a coating composition for siliconizing, and a method for manufacturing an electrical steel sheet using the ~~same~~ coating composition. The coating composition is ~~composed~~ formulated to enable a diffusion where Si atoms and Fe atoms are substituted with each other by an identical amount without nearly forming ~~an~~ any Fe-Si-bonded composite compound so as to avoid causing a surface defect at a diffusion reaction portion of the steel surface when the coating composition is coated on the surfaces of the electrical steel sheet and then annealed.--

Please replace the paragraph at page 10, beginning on line 12, with the following rewritten paragraph:

--Unit technologies employed in the present invention to control the diffusion amount of Si atoms will be ~~concretely~~ described in the below.--

Please replace the paragraph at page 10, beginning on line 15, with the following rewritten paragraph:

--First, to further ~~slack~~lower the diffusion rate of the Si component, powder containing only Si metal is not used but Fe-Si-based compound such as FeSi_2 , FeSi, Fe_5Si_3 or Fe_3Si ~~that, wherein~~ Si metal is bonded to Fe metal, is used as the main composition of the siliconizing coating agent. For this purpose, i.e., in order for the Fe-Si-based sintered powder to exist in a compound, the invention limits the Si content of the powder to 70 wt% or less.--

Please replace the paragraph at page 11, beginning on line 21, with the following rewritten paragraph:

--First, the inventive coating composition for siliconizing will be ~~concretely~~ described in detail.--

Please replace the paragraph at page 11, beginning on line 23 and ending on page 12, line 24, with the following rewritten paragraph:

--Fe-Si-based powder~~that is,~~ the main component of the coating composition for siliconizing of the present invention, can be manufactured by mixing Fe powder and Si powder with each other, and sintering the mixed powder at a temperature range of 1000 - 1200°C in mixture gas atmosphere of hydrogen and nitrogen for 3 - 5 hours, but is necessarily not restricted thereto and can be manufactured by various methods. At this time, the component ratio of the sintered powder compound is changed depending on the mixed amount of Fe powder and Si powder. Theoretically, when the mixed amount is 50%Si+50%Fe, the compound of FeSi_2 is created,~~;~~ when the mixed amount is 34%Si+66%Fe, the compound of FeSi is created,~~;~~ when the mixed amount is 25%Si+75%Fe, the compound of Fe_5Si_3 is created,~~;~~ and when the mixed amount is 14%Si+86%Fe, the compound of Fe_3Si is created. However, in actual sintering, small amounts of several compounds may exist according to an initial mixing state. In particular, when a sintering reaction is generated by a mixing of Fe powder and Si powder, the reaction ~~is progressed~~progresses in such a manner that Si atoms and Fe atoms are interdiffused to invade. Hence, although the amount of Si is somewhat large, the sintered powder ~~becomes~~ reaches a state in which most of FeSi_2 compound or FeSi compound corresponding to a state

~~that wherein~~ Fe atoms have been diffused ~~exist~~ and are present at the surfaces of the sintered powder and pure Si atoms ~~exist~~ are present at inside of the sintered powder. Accordingly, at most of the surface of the sintered powder, an Fe-Si-based compound exists present.--

Please replace the paragraph at page 12, beginning on line 25 and ending on page 13, line 20, with the following rewritten paragraph:

--In the present invention, the Si content in the Fe-Si-based sintered powder obtained as above is restricted to 20 - 70 wt%. If the Si content is less than 20wt%, it is so small and thus the diffusion rate may be very slow. Also, the high density of the sintered powder may cause ~~the a~~ drop of the dispersion while the coating process is performed ~~on the scene of production in practice~~. Since the content of Si exceeding 70wt% allows the main component to exist as FeSi_2 and a mixture of extra metal Si phase, the metal Si component contacts with the surface of material to increase the ~~creation~~ possibility of creating defects on the surface during the siliconizing process so that the control of the silicon content as siliconized may be difficult. In other words, by restricting the Si content contained in the Fe-Si-based sintered powder to a range of 20 - 70 wt%, it is possible to manufacture Fe-Si-based composite compound sintered powder having FeSi_2 , FeSi, Fe_5Si_3 or Fe_3Si as a main component. It is more preferable that the content of $\text{FeSi}_2 + \text{FeSi}$ amount the Fe-Si-based composite compounds should be restricted to 90wt% or more with respect to the total weight of the annealed powder.--

Please replace the heading on page 17, line 5 with the following rewritten heading:

--[Grain-oriented electrical steel sheet]--

Please replace the heading on page 21, line 14 with the following rewritten heading:

--[Non-oriented electrical steel sheet]--.

Please replace the paragraph at page 27, beginning on line 9, with the following rewritten paragraph:

--Hereinafter, the present invention will be described in more detail with respect to several presently preferred embodiments. It is ~~natural-understood~~ that the below described embodiments should not be understood so as to restrict the ~~technical~~-scope of the present invention--

Please replace the paragraph at page 44, beginning on line 21 and ending on page 45, line 14, with the following rewritten paragraph:

--The cold rolled steel sheets produced as above were intermediate-annealed under conditions shown in table 7. The intermediate-annealed steel sheets were coated with coating composition formed in a slurry state by mixing colloidal silica solution to 100 part by weight of Fe-Si-based ~~sintered-powders~~sintered-powder containing 45wt% Si, the colloidal silica solution being composed such that the solid matter of silica has 25 part by weight with respect to 100 part by weight of Fe-Si-based sintered powder. The coated steel sheets were dried at a temperature of 400 °C, and were coiled in a large sized coil. After that, the dried steel sheets were homogenized at 1125 °C in a nitrogen atmosphere containing 50% hydrogen for 5 hours. Afterwards, non-reacted substances remaining on the steel sheet where the siliconizing reaction was completed were removed. Thereafter, organic/inorganic composite coating agent having chromate and acryl-based resin as main components was coated to thereby manufacture final high silicon non-oriented electrical steel sheets on which the insulating coating layer was formed.

Please delete the paragraph heading on page 46, line 14.

Please replace the paragraph at page 46, beginning on line 15, with the following rewritten paragraph:

--As described above, the present invention uses Fe-Si-based sintered powder with an optimally adjusted composition as well as grain size, as a coating agent for siliconizing, so that ~~final-the finished~~ electrical steel sheets have a high silicon content ~~and accordingly~~. Accordingly, it is possible to effectively manufacture a high silicon electrical

steel sheet having superior magnetic properties in commercial frequency and high frequency bands.--